ART. XIV.—*Mineralogical Notes;* by WM. H. HOBBS. With Analyses by Herman Schlundt and Louis Kahlenberg.

1. *Cerussite with superficial film of galena from near Missoula, Mont.*

In February, 1894, I received from F. G. Bond, prospector at Missoula, Montana, a small specimen described as crystalline lead formed on the outside of a crystal. In the accompanying letter the following statements are made concerning it:

"The sample was found in a very soft talco-slate with narrow bands of dark limestone running parallel with the slate. The slate is cut by a dike of bird's eye porphyry that I traced over twenty miles. It is near this dike that our Iron Mountain mine is located."

The specimen sent is the only one that Mr. Bond had saved. The crystals referred to have a rather long prismatic habit with a length of 2–4^{mm}, and they show reëntrant angles in the prism zone, thus indicating that they are twinned individuals. They only rarely have terminal planes developed. They are white and somewhat translucent, but are partially covered by a glistening film of a metallic luster and very great tenuity. This thin superficial coating conforms perfectly to the form of the original crystal. A preliminary chemical examination showed that the material of the crystals is nearly pure lead carbonate. On charcoal in the oxidizing flame of the blowpipe the mineral boils and turns red but cools to yellow. In the reducing flame it yields a button of metallic lead. The crystals are completely soluble with effervescence in dilute nitric acid. Further examination failed to reveal any base besides lead. A complete chemical analysis of the mineral has been made on the small amount of material that could be spared for the purpose, by Mr. Herman Schlundt in the Chemical Laboratory of the University of Wisconsin. The results obtained in the analysis are given below in column I. Under II are given the calculated per cents of PbO and CO_2 in cerussite, and under III a recalculation of the analysis after deducting the silica, iron, and alumina which are derived from the gangue at the point of attachment of the crystals, and which could not be mechanically separated without too much loss of the valuable material.

	I.	II.	III.
PbO	80·83	83·52	83·90
CO_2	15·51	16·48	16·10
Fe_2O_3 (and Al_2O_3)	·55	----	----
SiO_2	2·15	----	----
S	trace.	----	----
Total	99·04	100·00	100·00

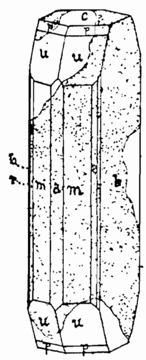
The substance was specially examined for other bases with negative results. The quantity of sulphur present was too small to be estimated in the quantity of substance available. The trace of sulphur and the excess of lead in the analysis over that in combination with CO_2 make it probable that the superficial coating on the crystals is galena.

Thanks to their metallic coating the crystals reflect well wherever it is present, though in other places they afford hardly a shimmer of light. By using a number of crystals complete measurement has been possible. The more important angles were measured a considerable number of times on different crystals. The observed forms are the following: *m*, ∞P (110); *a*, $\infty P\bar{\infty}$ (100); *r*, $\infty P\grave{3}$ (130); *b*, $\infty P\breve{\infty}$ (010); *c*, oP (001); u, $\frac{3}{2}P$ (332); *p*, P (111); and ɓ, $\infty P\breve{\frac{8}{3}}$ (380); the last mentioned form being, I believe, new to the species. These forms were determined by the following measurements:

		Measured.	Calculated.
$m \wedge m$	$110 \wedge 1\bar{1}0$	62° 47′	62° 46′
$m \wedge r$	$110 \wedge 130$	29 10	29 58
$r \wedge b$	$130 \wedge 010$	28 43	28 39
$m \wedge b$	$110 \wedge 010$	58 32	58 37
$m \wedge a$	$110 \wedge 100$	31 19	31 23
$m \wedge$ u	$110 \wedge 332$	25 51	25 39
$m \wedge p$	$110 \wedge 111$	34 33	35 46
$m \wedge c$	$110 \wedge 001$	89 57	90 0
$m \wedge$ ɓ	$1\bar{1}0 \wedge \bar{3}\bar{8}0$	31 19	31 35
$m \wedge \underline{m}$	$110 \wedge 110$	54 35	54 28
$m \wedge \underline{m}$	(over gap)	62 48	62 47
$m \wedge \underline{a}$	$110 \wedge 100$	27 15	27 14

With the exception of the face *p*, which is small, the reflections are good. Figure 1 illustrates the habit of an individual on which all the forms observed are represented. However, most of the crystals are stellate twins composed of three or more individuals. Figure 2 shows a cross section of such a twin composed of three individuals cut parallel to the basal pinacoid.

1.



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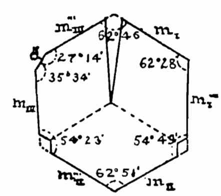

As the galena layer is nowhere found on the gangue material but occurs only on the surface of the cerussite crystals, it is clear that its formation is due to alteration of the cerussite by removal of carbon dioxide and addition of sulphur, probably through the action of sulphuretted hydrogen. It is therefore an *Umhüllungspseudomorphose* after cerussite. The pseudomorphs of calcite after cerussite from Grube Kautenbach bei Bernkastel show in cross sections a paper-thin layer of galena, which according to Blum* was formed on the surface of cerussite crystals. Calcite has been deposited over this and, after the removal of the cerussite, under it also. The Bernkastel pseudomorphs would thus seem to have been, in their first stage of alteration from cerussite, identical with those which are here described from near Missoula.

2. *Barite and Manganite from the Lucy Mine, Negaunee, Mich.*

In the spring of 1894, Mr. J. R. Thompson of Ishpeming, presented to the Museum of the University of Wisconsin some large specimens of barite and manganite. They were taken from the Lucy mine, formerly the McComber mine, at Negaunee, Michigan. This mine is located in the S. W. cor. of Sec.

* Blum, Pseudomorphosen, iii, p. 212. Cf. also Roth, Allgemeine u. Chemische Geologie. i, p. 188.

6, T. 47 N., R. 26 W., and is on the same vein as that portion of the Jackson mine in which manganiferous iron ore has been found. Well-crystallized manganite has been found in the Jackson mine and has been described by Professor E. S. Dana.*

Barite.—The barite from the Lucy mine is fairly well crystallized but the tabular crystals are arranged radially to the b axis. They average from one to two centimeters in length in the direction of the macrodiagonal, the habit being lath-shaped in this direction with the base the tabular plane. The forms observed are c, $0P$ (001); m, ∞P (110); a, $\infty \bar{P}\bar{\infty}$ (100); d,

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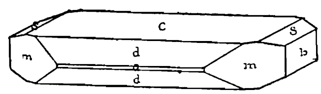


$\frac{1}{2}\bar{P}\bar{\infty}$ (102); b, $\infty \breve{P}\breve{\infty}$ (010); and S, $\frac{1}{4}\breve{P}\breve{\infty}$ (014)? Particularly in the zone of c and a precise measurements are of little value owing to the radial intergrowths of individuals, and hence the determination of d is only approximate. In the zone of c and b the following measurements were made:

		Measured.	Calculated.
$c \wedge b$	$001 \wedge 010$	90° 6′	90° 0′
$c \wedge S$	$001 \wedge 014$	17 12	18 12

The prism is easily determined to be the fundamental one m by being found parallel to the second cleavage.

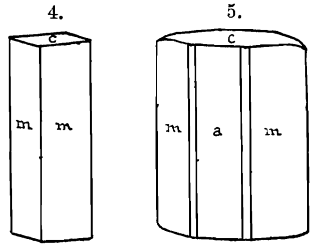
The crystals appear pink but the color is only superficial and is probably due to manganese, as the barite is associated with an ore of manganese. Figure 3 shows the usual development of the crystals.

Manganite.—The manganite from the Lucy mine is in quite simple crystals, those which are most intimately associated with the barite crystals being bounded simply by the fundamental prism and the base. The prism angle was measured by reflection and found to be 80° 4′, the calculated value being 80° 20′. These crystals are of columnar habit, 5–8^{mm} long, and usually of later formation than the barite. Other specimens of the substance less intimately associated with barite show crystals of a slightly different habit, the obtuse prism angle being truncated by the macropinacoid which has a large development. Rounding of the edge $a \wedge m$ and of the basal plane indicate the occurrence of indeterminate macroprism and brachydome. Figures 4 and 5 represent the type of manganite crystals from this locality.

* System of Mineralogy, 6th Ed., pp. 248 and 249.

An analysis of this mineral has been made by Mr. Herman Schlundt, Assistant in Chemistry at the University of Wisconsin, with the results given below in column I. In column II is given the theoretical composition of manganite and in column III the recalculated analysis with barium, calcium and magnesium, and hygroscopic water deducted.

4. 5.



	I.	II.	III.
Mn	60·29	62·42	62·36
H_2O (Hygroscopic)	·06	----	----
H_2O (Combined)	10·04	10·24	10·39
$BaCO_3$ and $CaCO_3$	·58	----	----
$MgCO_3$	2·98	----	----
O (Calculated)	26·35	27·34	27·25
Total	100·30	100·00	100·00

A specimen of manganese ore from the Bonnie mine, Michigan, recently donated to the University of Wisconsin by John E. Burton, Esq., of Milwaukee, is quite pure manganite. A portion of the specimen exhibits rounded orthorhombic crystals not unlike the Lucy mine crystals, but these are less perfect and altogether unsuited to measurement.

3. *Chloritoid from blocks on the South Shore of Michigamme Lake, Michigamme, Mich.*

This mineral is included in specimens of a phyllitic schist which were collected by Dr. Van Hise from blocks on the south shore of Michigamme lake, Michigamme, Michigan. The blocks are very abundant and are often as large as a good sized room. Professor Van Hise feels sure that the rock will be found *in situ* in the near vicinity of the blocks, probably in the bed of the Michigamme river.

Thin sections of the rock show it to be largely made up of a colorless mica in fine scales, through the mass of which are distributed large flakes of biotite. The latter are not arranged with reference to any particular direction, but sometimes assume radial groups. They are many times the size of the muscovite scales and are probably like the chloritoid metamorphic in their origin. A few acicular crystals of black tourmaline from a third of a centimeter to a centimeter in length occur in the mass of the rock and also as inclusions in the large chloritoid crystals. Irregularly outlined masses of magnetite are likewise to be found both in the chloritoids and in the matrix of the rock, but those which are included in the chloritoids are surrounded by a zone of quartz, which was probably formed at the same time as the chloritoid as one of the products of the recrystallization of that portion of the rock now occupied by the large crystals of chloritoid and its inclusions. Besides the large porphyritic chloritoids, which are at times six centimeters or more across, a few small blades are disseminated like the biotite through the rock mass.

The porphyritic crystals of chloritoid are tabular parallel to the base, of hexagonal outline, and are on an average about one-third as thick as they are long or broad. Their hardness is between five and six of Mohs's scale. That they are generally twinned is seen in the examination of the hand specimen by the variation in the position of the plane of basal cleavage in different parts of the same crystal. In at least one specimen the twinning line is straight and runs parallel to one of the lateral faces ($\infty P\breve{\infty}$). Before the mineral had been examined in section and the nature of its enclosures had been determined, a specimen was submitted to Mr. Louis Kahlenberg of the Chemical Laboratory of the University of Wisconsin for chemical analysis. His results, which are given below, are therefore much affected by the included quartz and magnetite, which might have been excluded by treatment with the magnet and dissolving the residue as far as possible in sulphuric acid. The results are, however, sufficient to determine the mineral as chloritoid and are nearly identical with an analysis by Jackson of masonite from Natic, R. I., which like this was probably impure from admixed quartz and magnetite.

SiO_2	35·52
Al_2O_3	29·53
Fe_2O_3	5·85
FeO	22·38
MgO	0·76
CaO	1·38
H_2O	5·94
P_2O_5	trace.
Total	101·36

To determine the optical properties of the mineral a large twinned crystal was sawed so as to make three thin sections; the first parallel to the basal cleavage of a considerable part of the crystal (oP), the second normal to this section and parallel to the noticeable straight twinning line and its parallel edge ($\infty P \grave{\infty}$), and the third normal to the first two sections ($\infty P \bar{\infty}$). From an examination of these sections it was determined that the mineral is either monoclinic or triclinic with a close approach to monosymmetric character. The basal cleavage is very perfect and a second distinct cleavage runs parallel to either a steep pyramid or a prism, for the two directions are inclined about 120° to one another and about 90° to the base. A third irregular cleavage follows the clinopinacoid. The index of refraction is high and the double refraction very low. The

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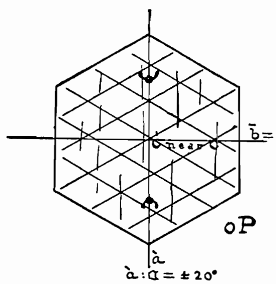

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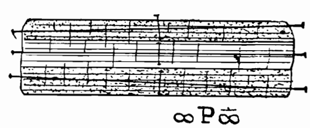

plane of the optic axes bisects (nearly) the obtuse angle of the cleavage and the positive bisectrix (probably obtuse) is nearly normal to the base. The absorption is:

$\mathfrak{a}$ olive green to greenish gray.
$\mathfrak{b}$ deep robin's egg blue.
$\mathfrak{c}$ light yellow green.
with $\mathfrak{b} > \mathfrak{a} > \mathfrak{c}$

The crystal is polysynthetically twinned so that the "ortho-pinacoidal" section afforded lamellæ corresponding to three positions—one of which has parallel extinction, and the other two have extinction angles of 14–24° on opposite sides of the basal cleavage lines (see Fig. 5.) This corresponds to the Tschermak law where the individuals are inclined 120° to one another. These three sorts of lamellæ are also observed on the "clinopinacoidal" section.

4. *Apatite and Hessonite in a Pegmatite from Canaan, Ct.*

South of the Canaan Valley post office and east of the small stream known as the Whiting river in the township of Canaan, Ct., the gneiss of the district is cut by veins of pegmatite in which occur several crystallized minerals. As the locality has not been described the minerals of these veins may deserve a passing mention. The most abundant of these are a white feldspar which sometimes appears in crystals having dimensions of as much as eight inches, and a green or colorless muscovite in elongated hexagonal crystals measuring several inches on an edge. These muscovite plates frequently enclose quartz in bi-pyramidal crystals in form and size much resembling the well known quartzes from Edwards, N. Y. Biotite is less abundant than the muscovite and occurs in small black plates. Crystals and aggregates of black tourmaline as large as one's fist are not rare. A cinnamon-colored garnet is found sometimes in distinct crystals as much as a half-inch in diameter, sometimes intergrown with the feldspar so as to produce a structure resembling graphic granite. One crystal of green apatite was found which was over two and a half inches in length and an inch in diameter. It was broken in removing from the rock, but the fragments show the crystal to be bounded in the prism zone by both the first and second order prisms in about equal development. A more careful examination of the locality would perhaps reveal other minerals.